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Mass analysis

The process by which a mixture of ionic or neutral species is identified according to their mass/charge ratios (ions) or their aggregate atomic masses (neutrals). The analysis may be quantitative or qualitative.

Mass number (m)

The sum of the total number of protons and neutrons in an atom, ion or molecule.

Mass spectrograph

An instrument in which the beams of ions are separated (analysed) according to the mass/charge ratio and the mass spectrum is recorded on a photographic plate or film.

Mass spectrometer

An instrument in which the beams of ions are separated (analysed) according to the mass/charge ratio and the ions are measured electrically.

Mass spectrometer operating on the linear accelerator principle

A mass spectrometer in which the ions to be separated absorb maximum energy through the effect of alternating electric fields parallel to the direction of ion motion. These ions are then separated from other ions of different mass/charge by an additional electric field.

Mass spectrometry

The branch of science that deals with all aspects of mass spectroscopes and the results obtained with these instruments.

Mass spectrometry/mass spectrometry MS/MS

See *tandem mass spectrometer*.

Mass spectroscopie

A term (now obsolete) which may refer to either a mass spectrometer or a mass spectrograph.

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Mass spectroscopy

The study of systems by a process of forming gaseous ions, with or without fragmentation, which are then characterized by their mass/charge ratios and their relative abundances.

Mattauch-Herzog geometry

An arrangement for a double-focusing mass spectrograph in which a deflection of $\pi/(4\sqrt{2})$ radians in a radial electrostatic field is followed by a magnetic deflection of $\pi/2$ radians.

Nier-Johnson geometry

An arrangement for a double-focusing mass spectrometer in which a deflection of $\pi/2$ radians in a radial electrostatic field analyser is followed by a magnetic deflection of $\pi/3$ radians. The electrostatic analyser uses a symmetrical object-image arrangement and the magnetic analyser is used asymmetrically.

π/n radian ($180^\circ/n$) magnetic sector

An arrangement in which an ion beam is deflected magnetically through π/n radians, where $n > 1$.

Prolate trochoidal mass spectrometer

A mass spectrometer in which the ions of different mass/charge ratios are separated by means of crossed electric and magnetic fields in such a way that the selected ions follow a prolate trochoidal path. The commonly used term "cycloidal" is incorrect and should not be used as the path is not cycloidal. (A cycloid is a special case of a trochoid). See *crossed electric and magnetic fields*.

Quadrupole ion storage trap (Quistor)

An arrangement in which ions with a desired range of mass/charge ratios are trapped by making them describe stable paths under the influence of a static and a high frequency, electric, quadrupole field. See *ion trap*.

Quadrupole mass analyser

An arrangement in which ions with a prescribed mass/charge ratio are made to describe a stable path under the influence of a static and a high frequency electric field and are then detected. Ions with different mass/charge ratios are separated from the detected ions because of their unstable paths.

12.3.2 Types of ions

Adduct ion

An ion formed by interaction of two species, usually an ion and a molecule, and often within an ion source, to form an ion containing all the constituent atoms of one species as well as an additional atom or atoms.

Cluster ion

An ion formed by the combination of two or more atoms, ions or molecules of a chemical species, often in association with a second species.

Daughter ion

An electrically charged product of reaction of a particular parent (precursor) ion. In general such ions have a direct relationship with a particular precursor ion and may relate to a unique state of the precursor ion. The reaction need not involve fragmentation, but could, for example involve a change in the number of charges carried. Thus a fragment ion is a daughter ion but not all daughter ions are fragment ions.

Dimeric ion

An ion formed when a chemical species exists in the vapour as a dimer and can be detected as such, or when a molecular ion can attach to a neutral molecule within the ion source to form an ion such as $[M_2]^{+}$ where M represents the molecule.

Even-electron ion

An ion containing no unpaired electrons, e.g. CH_3^+ in its ground state.

Fragment ion

An electrically charged dissociation product of an ionic fragmentation. Such an ion may dissociate further to produce other electrically charged molecular or atomic moieties of successively lower formula weight. See also *daughter ion*.

Isotopic ion

Any ion containing one or more of the less abundant naturally occurring isotopes of the elements that make up its structure, e.g. CH_2D^+ .